IMAGE PICKUP APPARATUS AND ITS CONTROL METHOD

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an image pickup apparatus for outputting AV (Audio Video) data including image data and sound data to an external, and to its control method.

Related Background Art

Camera-integrated digital video recorders have been developed recently which have a digital interface (IEEE1394 interface) in conformity with the IEEE1394-1995 standards.

External storage devices have also been developed recently which can record AV data digitally output from an IEEE1394 interface of a camera-integrated digital video recorder.

If a user desires to record AV data recorded by a camera-integrated digital video recorder in an external storage device, the user interconnects the camera-integrated digital video recorder and external storage device, instructs the camera-integrated digital video recorder to start recording, and at the same time instructs the external storage device to start recording.

With this method, a user is required to instruct both the camera-integrated digital video recorder and

external storage device to start recording. This operation is cumbersome and a user load is large.

SUMMARY OF THE INVENTION

The invention has been made in order to solve the above problem. It is an object of the invention to record AV data recorded by an image pickup apparatus in an external storage device without cumbersome operations.

According to a preferred embodiment of the invention, an image pickup apparatus comprises: recording means for recording AV data including image data and sound data; and communication means for staring an output of AV data to be recorded in the recording means in response to an instruction of a record start and for stopping an output of AV data to be recorded in the recording means in response to an instruction of a record stop.

Still other objects of the present invention, and the advantages thereof, will become fully apparent from the following detailed description of the embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of a recording system according to an embodiment.

Fig. 2 is a flow chart illustrating the operation to be performed by an image pickup apparatus according

to an embodiment.

Figs. 3A, 3B, 3C, 3D and 3E are diagrams illustrating AV data to be digitally output from the image pickup apparatus of the embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of the invention will be described with reference to the accompanying drawings.

Fig. 1 is a diagram showing a recording system according to an embodiment. Referring to Fig. 1, the recording system has a camera-integrated digital video recorder (hereinafter called an image pickup apparatus) 100 and an external storage device 120 for storing AV data digitally output from the image pickup apparatus 100.

Next, with reference to Fig. 1, the main structure of the image pickup apparatus 100 of the embodiment will be described. Referring to Fig. 1, the image pickup apparatus 100 has an image pickup unit 101, a microphone 102, a recording/reproducing unit 103, a storage medium 104, a control unit 105, a communication unit 106 and an operation unit 107.

The image pickup apparatus 100 has a "camera mode" and a "VTR mode". A user can select either the "camera mode" or the "VTR mode" by operating a mode select key of the operation unit 107.

When the camera mode is selected, the control unit

105 activates the image pickup unit 101 and microphone 102 and makes the recording/reproducing unit 103 enter a record state or a record stop state. During this mode, the user can change the state of the recording/reproducing unit 103 either to the record state or the record stop state by operating a trigger key of the operation unit 107.

When the VTR mode is selected, the control unit 105 stops the image pickup unit 101 and microphone 102 and activates the recording/reproducing unit 103. During this mode, the user can reproduce AV data recorded in the storage medium 104, temporarily stop, fast feed, or rewind by operating the operation unit 107.

During the camera mode, the image pickup unit 101 picks up an optical image of a subject to generate image data. The image data generated by the image pickup unit 101 is supplied to the recording/reproducing unit 103. During the camera mode, the microphone 102 collects external sounds to generate sound data. The sound data generated by the microphone 102 is supplied to the recording/reproducing unit 103.

The recording/reproducing unit 103 generates AV data in conformity with a data format (e.g., the standard definition (SD) data format) defined by a home digital VCR scheme (hereinafter called a DV scheme) by

HD Digital VCR Conference. This AV data includes the image data generated by the image pickup unit 101, the sound data generated by the microphone 102 and associated additional data.

The AV data to be recorded in the storage medium 104 by the recording/reproducing unit 103 or the AV data reproduced from the storage medium 104 by the recording/reproducing unit 103 is supplied to the communication unit 106.

The communication unit 106 has a digital interface in conformity with the IEEE1394-1995 standards or extended standards. If the external storage device 120 is connected to the communication unit 106, the communication unit 106 digitally outputs AV data supplied from the recording/reproducing unit 103 in accordance with a predetermined communication protocol (e.g., a communication protocol in conformity with the IEC61883 standards).

With reference to Figs. 3A to 3E, a procedure to be executed by the image pickup apparatus 100 of the embodiment will be described, this procedure digitally outputting AV data in conformity with the SD format of the 525-60 scheme (NTSC scheme) in accordance with the communication protocol in conformity with the IEC61883 standards.

First, the communication unit 106 generates ten DIF sequences from AV data for one frame supplied from

the recording/reproducing unit 103, as shown in Figs. 3A and 3B. As shown in Fig. 3C, each DIF sequence is constituted of a header section, a sub-code section, a VAUX section and an audio & video section. Image data and sound data are stored in the audio & video section.

Next, the communication unit 106 generates one hundred and fifty DIF blocks from each DIF sequence, and an isochronous packet from six DIF blocks, as shown in Figs. 3D and 3E. Each isochronous packet is digitally output at every 125 μs in accordance with the isochronous transfer scheme defined by the IEEE1394-1995.

Next, the main structure of the external storage device 120 of the embodiment will be described with reference to Fig. 1. Referring to Fig. 1, the external storage device 120 has a communication unit 121, a record unit 122, a storage medium 123, an operation unit 124 and a control unit 125.

Similar to the communication unit 106, the communication unit 121 has a digital interface in conformity with the IEEE1394-1995 standards or extended standards. The communication unit 121 digitally inputs AV data digitally output from the communication unit 106 of the image pickup apparatus 100 in accordance with a predetermined communication protocol (e.g. a communication protocol in conformity with the IEC61883 standards). The communication unit 121 receives the

isochronous packet shown in Fig. 3E at every 125 μs to generate AV data shown in Fig. 3A and supply it to the recording unit 122.

The recording unit 122 records AV data supplied from the communication unit 121 in the storage medium 123. The data format of AV data to be recorded in the storage medium 123 by the external storage device 120 is the same as the data format of AV data to be recorded in the storage medium 104 by the image pickup apparatus 100. In this embodiment, the storage medium 123 is a randomly accessible storage medium such as a magnetic disc, an optical disc, and a hard disc.

Next, with reference to Fig. 2, the main procedure to be executed by the image pickup apparatus 120 of the embodiment will be described. A portion of the procedure shown in Fig. 2 is realized by a microcomputer of the control unit 105 which operates in accordance with a control program stored in a storage medium of the control unit 105.

Step S201: The control unit 105 judges whether the current operation mode is the camera mode. If the operation mode is the camera mode, the flow advances to Step S202, whereas if not, the procedure is terminated.

Step S202: The control unit 105 judges whether the external storage device 120 is connected to the communication unit 106. If connected to the external storage device 120, the flow advances to Step S203,

whereas if not, the procedure is terminated.

Step S203: The control unit 105 judges whether an instruction of a record start is input. The instruction of the record start is input to the control unit 105 if the trigger key of the operation unit 107 is operated. If this instruction of the record start is input, the flow advances to Step S204.

Step S204: The control unit 105 instructs the recording/reproducing unit 103 to start recording AV data, and at the same time instructs the communication unit 106 to start digitally outputting AV data. The recording/reproducing unit 103 records the AV data in the storage medium 104, and at the same time supplies AV data recorded in the storage medium 104 to the communication unit 106. The communication unit 106 digitally outputs the AV data supplied from the recording/reproducing unit 103 to the external storage device 120.

Step S205: The control unit 105 judges whether the recording/reproducing unit 103 in operation has any trouble. If the recording/reproducing unit 103 cannot record AV data normally (e.g., if the capacity of the storage medium 104 becomes insufficient), the recording/reproducing unit 103 automatically stops the record of AV data and notifies the control unit 105 of the trouble.

Step S206: The control unit 105 makes the

recording/reproducing unit 103 stop the record of AV data, although it makes the communication unit 106 continue to digitally output AV data.

Step S207: The control unit 105 judges whether an instruction of a record stop is input. The instruction of the record stop is input to the control unit if the trigger key of the operation unit 107 is operated. If the record stop instruction is input, the flow advances to Step S208.

Step S208: The control unit 105 makes the recording/reproducing unit 103 stop recording AD data, and at the same time makes the communication unit 106 stop digitally outputting AV data.

As described above, according to the recording system of this embodiment, digitally outputting AV data can be started or stopped only by operating the trigger key of the operation unit 107 of the image pickup apparatus 100. Therefore, without any cumbersome operation, AV data recorded by the image pickup apparatus 100 can be recorded also in the external storage device 120. Furthermore, since AV data recorded by the image pickup apparatus 100 can be recorded in the external storage device 120, a dubbing time can be dispensed with and the edit work efficiency can be improved.

According to the recording system of the embodiment, even if the recording/reproducing unit 103

becomes unable to record AV data after the record start instruction is input (e.g., even if the capacity of the storage medium 104 becomes insufficient), it is possible to continue to digitally output AV data until the record stop instruction is input, so that AV data not recorded by the image pickup apparatus 100 can be reliably recorded in the external storage device 120.

The invention may be embodied in other specific forms without departing from essential characteristics thereof.

For example, the data format of AV data of the embodiment is not limited only to the data format in conformity with the DV scheme, but it may be the data format in conformity with a transport stream scheme of MPEG2.

Therefore, the above-described embodiments are merely exemplary of this invention, and are not construed to limit the scope of the present invention.

The scope of the present invention is defined by the scope of the appended claims, and is not limited to only the specific descriptions in this specification. Furthermore, all the modifications and changes belonging to equivalents of the claims are considered to fall within the scope of the invention.